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ABSTRACT

This minicourse was prepared for use with secondary physics students in the Dallas Independent School District and is one option in a physics program which provides for the selection of topics on the basis of student career needs and interests. This minicourse was aimed at providing the student with the opportunity to compare scientific theory with superstition, creating a better understanding of the processes involved in scientifically testing a belief. The minicourse was designed for independent student use with close teacher supervision and was developed as an ESEA Title III project. A rationale, behavioral objectives, student activities, and resource packages are included. Student activities and resource packages involve defining science, scientific method, and superstition, surveying superstitions, and investigating how superstitions develop and are disproved. (GS)

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CAREER ORIENTED PRE-TECHNICAL PHYSICS

Science and Superstition

Minicourse

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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dallas independent school district

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CAREER ORIENTED PRE-TECHNICAL PHYSICS

Science and Superstition

Minicourse

ESEA Title III Project

1974

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March 25, 1974

This Mini Course is a result of hard work, dedication, and a comprehensive program of testing and improvement by members of the staff, college professors, teachers, and others.

The Mini Course contains classroom activities designed for use in the regular teaching program in the Dallas Independent School District. Through Mini Course activities, students work independently with close teacher supervision and aid. This work is a fine example of the excellent efforts for which the Dallas Independent School District is known. May I commend all of those who had a part in designing, testing, and improving this Mini Course.

I commend it to your use.

Sincerely yours,

Nolan Estes

Nolan Estes
General Superintendent

mfs

CAREER ORIENTED PRE-TECHNICAL PHYSICS TITLE III ESEA PROJECT

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CAREER ORIENTED PRE-TECHNICAL PHYSICS

SCIENCE AND SUPERSTITION

MINICOURSE

RATIONALE (What this minicourse is about)

This minicourse is about some of the superstitions peoples have devised, how they came to be, and ways to test a belief to find out whether or not it may be scientific. Think about such statements as:

"The earth is flat."
"All aspirin is NOT alike."
"There are seven (7) major planets in the solar system."
"Astrology is a science."
"The walls of this room are mostly empty space."
"Palm readers can tell your future."

This minicourse will give you an opportunity to compare scientific theory with superstition and will suggest ways for you to evaluate beliefs that you may encounter in the future. If you choose a technological or science-oriented vocation, an understanding of how science compares to superstition should be very useful.

If you are a female, intent upon a satisfying and profitable career in a "man's world," this minicourse can help you dispel the myth that any one sex is less emotional or more analytical than the other. When you have finished this minicourse, you should have a <u>better</u> <u>understanding</u> of how to go about scientifically testing a belief or an idea than most males you'll encounter.

In addition to RATIONALE, this minicourse contains the following sections:

1) TERMINAL BEHAVIORAL OBJECTIVES (Specific things you are expected to learn from the minicourse)

2) ENABLING BEHAVIORAL OBJECTIVES (Learning "steps" which will enable you to eventually reach the terminal behavioral objectives)

3) ACTIVITIES (Specific <u>things</u> <u>to</u> <u>do</u> to help you learn)

4) RESOURCE PACKAGES (Instructions for carrying out the learning activities, such as procedures, references, laboratory materials, etc.)

5) EVALUATION (Tests to help you learn and to determine whether or not you satisfactorily reach the terminal behavioral objectives):
   a. Self-test(s) with answers, to help you learn more.
   b. Final test, to measure your overall achievement.

TERMINAL BEHAVIORAL OBJECTIVES:

When you have completed this minicourse, you will demonstrate an understanding of science and superstition by being able to:

1) Write a definition of the terms, "science," "scientific method," and "superstition."

2) List at least five (5) currently held superstitious beliefs and suggest scientific investigations that might be used to prove or to disprove each belief.

3) Compare and contrast science and superstition by:

   a. listing five (5) beliefs formerly held to be true, but presently held to be false;

   b. listing five (5) beliefs formerly held to be false, but currently held to be true;

   c. giving the scientific explanation for each of ten (10) occurrences or phenomena listed in (a) and (b) of this objective, along with the names of some of the scientists who developed the particular proof or disproof.

4) Write a paragraph explaining how superstitious beliefs arise.

5) Write your own "original superstition" based upon your understanding of the origins of superstition.

ENABLING BEHAVIORAL OBJECTIVE #1:	ACTIVITY 1-1	RESOURCE PACKAGE 1-1
Write an accepted definition of the terms, "superstition," "science," and "scientific method."	Read Resource Package 1-1.	"Definitions"

ENABLING BEHAVIORAL OBJECTIVE #1:	ACTIVITY 1-2	
(See Page 2 for statement of this objective.)	Write a definition of "superstition," "science," and "scientific method." Compare your definitions with those given in Resource Package 1-1.	
ENABLING BEHAVIORAL OBJECTIVE #2:	ACTIVITY 2-1	RESOURCE PACKAGE 2-1
List five (5) currently held superstitions and suggest scientific investigations that might be used to prove or to disprove each.	Conduct the survey described in Resource Package 2-1.	"Superstition Survey"
	ACTIVITY 2-2	RESOURCE PACKAGE 2-2
	Read Resource Package 2-2. Follow instructions carefully.	"Tape Talks"
	ACTIVITY 2-3	RESOURCE PACKAGE 2-3
	Complete Resource Package 2-3.	"Worksheet"
ENABLING BEHAVIORAL OBJECTIVE #3:	ACTIVITY 3-1	RESOURCE PACKAGE 3-1.1
List five (5) beliefs that were formerly held to be true but that are now considered false; in addition, list the scientific explanation and the names of some scientists who disproved each belief. Do the same for five (5) beliefs formerly held to be <u>false</u> but now held to be <u>true</u>.	Read Resource Package 3-1.1 and complete Resource Package 3-1.2.	"Reading Assignment"
	ACTIVITY 3-2	RESOURCE PACKAGE 3-1.2
	Read the beliefs you listed in Resource Package 3-1.2 to other students. Ask them if, in their opinions, science has proved or disproved these old beliefs. Tabulate (list in table form) these responses.	"Written Assignment"

ENABLING BEHAVIORAL OBJECTIVE #4: Write a paragraph explaining how superstitious beliefs arise.	ACTIVITY 4-1 Complete Resource Package 4-1. ACTIVITY 4-2 Complete Resource Package 2-2 (side 2 of tape).	RESOURCE PACKAGE 4-1 "Reading Assignment"
ENABLING BEHAVIORAL OBJECTIVE #5: Write an "original superstition" based upon your understanding of the origins of superstition.	ACTIVITY 5-1 Do Resource Package 5-1.	RESOURCE PACKAGE 5-1 "An 'Original Superstition'"
EVALUATION	ACTIVITY 6-1 Take the Self-test (Resource Package 6-1.1). Check your answers, using Resource Package 6-1.2.	RESOURCE PACKAGE 6-1.1 "Self-test (Science and Superstition)" RESOURCE PACKAGE 6-1.2 "Answers to Self-test (Science and Superstition)"
	ACTIVITY 6-2 If you feel you are ready, ask your teacher for the final test (Resource Package 6-2). If you do not feel prepared, ask for some extra help, supplemental assignments, etc.	RESOURCE PACKAGE 6-2 "Terminal Evaluation (Science and Superstition)"

RESOURCE PACKAGE 1-1

DEFINITIONS

Any dictionary or encyclopedia that you use will give a slightly different definition of terms. It is not desirable that you memorize exact definitions, but it is important that you learn the meaning of these terms. The following meanings are from Webster's Third New International Dictionary:

Science - possession of knowledge as distinguished from ignorance or misunderstanding; accumulated and accepted knowledge that has been systematized and formulated with reference to the discovery of general truths or the operation of general laws; knowledge obtained and tested through use of the scientific method.

Scientific method - the principles and procedures used in the systematic pursuit of knowledge, involving (1) recognition and formulation of a problem, (2) collecting data through observation and/or experiment, (3) formulation of an hypothesis, and (4) testing and confirmation of the hypothesis formulated.

Superstition - a belief, act, conception, or practice resulting from ignorance, unreasoning fear of the unknown or mysterious, trust in magic or chance, or a false conception of causation; a notion maintained despite evidence to the contrary.

RESOURCE PACKAGE 2-1

SUPERSTITION SURVEY

I. Interview four (4) or more persons in each of these three (3) age groups: under 25 years of age, 25 years to 55 years of age, and over 55 years of age. Record "true" or "false" answers on a table such as this:

	UNDER 25		25-55		OVER 55	
QUESTIONS	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE
1.						
2.						
3.						
etc.						

Survey Questions:

1. "Bad air" around swamps and marshes can cause diseases such as malaria.
2. It is dangerous to eat fish and drink milk at the same meal.
3. Black cats can bring bad luck.
4. Spilling salt is a "bad luck" sign.
5. It is probably better to stay in hotel room #12 than room #13.
6. It is a good idea to carry a rabbit's foot or to pick a four-leaf clover for luck.

7. If your nose itches, you are going to have company.

8. It is a good idea to knock on wood for luck.

9. A person would be better off to regularly read his horoscope in magazines, books, or daily papers.

10. A new husband should carry his bride over the threshold for good luck.

11. It is a good idea to make a wish when one sees a new moon, sees a falling star, sees the "first star" of evening, or breaks a "wish bone."

12. Red hair can be associated with bad temper or a bad disposition.

13. Some people can locate underground water by using a "divining rod" or special stick.

Survey Suggestions:

When you approach the person to be interviewed, do not use the word, "superstition." Simply ask the person to answer a few questions for a survey you are doing for your science class. Do you think that using the word, "superstition," might possibly bias or prejudice a person's responses? Do you think that the more persons you interview, the more confidence you will have in your results?

Related Ideas:

Conducting and interpreting surveys is a part of the science of statistics. By sampling (looking at smaller "parts") of a larger group of people or things (a population), statisticians can determine the general characteristics of that population. In this activity, you will have the role of statistician. Your three populations will be ALL of the people in your community who are: under 25 years of age, 25 to 55 years of age, and over 55 years of age. Your three population samples will be ONLY those persons in each age category who respond to your questionnaire. Can you see why statisticians might place more trust (confidence) in larger samples?

II. (Optional) This is an "open" kind of investigation with several possibilities:

First, establish liaison (working relationship) with other physics classes in your school, with physics classes in other schools in your community, or with schools in other communities within or outside your state. A friend, a telephone call, or a letter can be used to establish liaison. Second, furnish the survey questions and instructions to your co-workers in other schools. Third, exchange survey data with your co-workers. Fourth, compare your data with their data. Last, write a report of these comparisons and submit it to your teacher for evaluation.

Would this be a good Science Fair project? Perhaps your results are of interest to:

your school paper?
your local P. T. A.?
your local newspaper?
your local civic groups?
a science education publication?

People who conduct studies of interest and of value are encouraged to publish (or otherwise make known) their findings. This is how technicians and scientists keep one another informed.

RESOURCE PACKAGE 2-2

TAPE TALKS

1. Get out a pencil and paper. Prepare to take notes and to answer questions from the taped material.

2. Ask your teacher for a tape player. Be sure you know how to use the machine.

3. Your teacher will designate which side of the tape to study. (You will study the other side later on in this course.) As you play the designated side, stop the player while you think about an answer or to repeat portions of the tape for better understanding.

4. When you finish, ask whether the teacher wants you to use the "fast forward" switch to advance the tape to its end or whether you are to use the "fast reverse" switch to ready the tape for side 1 use again. The tape should then be returned to its box and stored in its envelope.

RESOURCE PACKAGE 2-3

WORKSHEET

Answer the following questions on notebook paper; then ask the teacher to look at your answers and to discuss them with you:

1. What differences, if any, did you observe in the pattern of superstitious belief according to age?

2. What were the general subjects (areas) of most of the superstitions?

3. Which five (5) superstitions seemed to be most widely held?

4. Can you think of ways that these five superstitions might be tested to see if they are true or false?

5. List at least five (5) additional superstitious beliefs.

6. Select any five (5) of the superstitions in your survey and write down why you think people believed in these superstitions.

RESOURCE PACKAGE 3-1.1

READING ASSIGNMENT

Read "Breakthroughs in Science," Volume S, of Compton's Encyclopedia. Also, in The World Book Encyclopedia, Volume S (Volume S-Sn in newer editions), read the subtopic, "History," under the general topic, "Science." If these are not available to you, ask your teacher for references.

RESOURCE PACKAGE 3-1.2

WRITTEN ASSIGNMENT

I. Prepare a list of at least ten (10) old beliefs that were disproved by scientists. Record the names of scientists who worked on each of the scientific investigations related to these beliefs. Two examples follow:

1) Ancient people believed that the sun moved around the earth. Copernicus used mathematics and the scientific method to prove that the earth moves around the sun.

2) Ancient people believed that evil spirits, bad air, and many other such things were responsible for food spoiling and for disease. Pasteur proved that micro-organisms cause disease and food spoilage.

Got the idea? Now add eight (8) more examples from your reading.

II. Do the same for at least eight (8) old beliefs that were proved valid by scientists.

RESOURCE PACKAGE 4-1

READING ASSIGNMENT

In the World Book Encyclopedia, Volume S (Volume So-Sz in newer editions), read the entire topic, "Superstition." If this reference is not available, request instructions from your teacher.

Read additional material on this topic. Use such reference sources as your teachers, your librarians, etc. Submit a bibliography of these readings to your teacher. Each article listed should be accompanied by title, author, date, publisher, place, and page numbers.

Consider these statements in a recent national magazine, designed to sell a $6.95 book of mystic chants:

a) Nora H. was a complete failure in love and marriage. Desperate, she whispered the Mystic Chant you'll find on page 47 of this amazing book. Within a short span she projected her ideal mate, a young handsome attorney--and was soon happily married!

b) A young girl slaved as a lowly clerk and her parents made her life miserable. To get out of her rut, she used the set of Chants on page 52. As if by magic, she was offered a position with a leading department store, designing new fashions. Soon she was traveling to Paris, London, Rome, and making more money than she ever dreamed possible!

c) A woman needed $1,000 to help her mother get an operation to make her well. She had no way of getting the cash, but kept repeating the Mystic Chant you'll find on page 144. The next morning a famous surgeon made an appointment with her--and assured her that he would operate on her mother without charge!

d) A man was in desperate need of cash and was told there were "powerful forces" working against him. Then he spoke the Mystic Chant on page 53. Within the hour, he was awarded more money than he had ever seen in his life--$150,000!

You are living in what has been called "The Age of Reason." Are the appeals of this ad unreasonable? Do you consider such ads to be ethical? Do you consider them to be scientific? Answer these questions in writing and submit them to your teacher for evaluation.

This Resource Package began on page 13. Should you fear this section because it begins with an "unlucky number"?

MOTHER ANNA

Gifted Reader and Advisor

Friends, if you have a troubled mind and need guidance, see this Reader who has helped many with their troubles and sorrows.

She can help you if you are in poor health, confused, disappointed in life, have business problems, have love troubles, or have marriage problems. Come and see Mother Anna. She will show you the way to happiness and success. Don't classify Her with Fortune Tellers or False Healers.

She will help you no matter what your problem may be. She will succeed.

Mother Anna is the Only One who can help you with Any Problems. So, friends, come and see for yourselves--seeing is believing.

Don't hesitate a day longer. She can help you!

RESOURCE PACKAGE 5-1

AN "ORIGINAL SUPERSTITION"

To complete this assignment, you must have some understanding of what superstitions are and how they develop. To "create" your own original superstitious belief, think first of familiar surroundings. In this room or in your home, are there things that you do not fully understand? Can you devise an explanation for these unknowns based solely upon just what you see or hear, and not upon any investigation or study?

Have you ever:

a. Wondered what a primitive jungle tribesman might think if he were to see a large-screen movie, a television receiver set in operation, or a jet plane at take-off?

b. Seen toad stools (mushrooms) several inches high, where none existed the day before?

c. Had black cats cross your path?

Remember, a superstition can seek to explain what happens or why it happens. It can deal also with causing things to happen or preventing them from happening. After you write out your "original superstition," read it or tell it to a classmate or to your teacher along with your scheme for testing this superstition to see if it is true or false.

RESOURCE PACKAGE 6-1.1

SELF-TEST (SCIENCE AND SUPERSTITION)

1. Define:

   a. science
   b. scientific method
   c. superstition

2. List three (3) currently held superstitions and tell, briefly, how each might be investigated scientifically.

3. What are the characteristics of groups of people who are the most superstitious?

4. Why have people developed superstitious beliefs?

5. List ten (10) old beliefs that have been disproved by scientific experimentation and name the scientists who were associated with each; or, instead, do the same for five (5) old beliefs that have been proved true.

6. Write down your "original superstition." Now tell how it could be investigated, using the scientific method.

RESOURCE PACKAGE 6-1.2

ANSWERS TO SELF-TEST (SCIENCE AND SUPERSTITION)

Note: Definitions can be stated in many ways to convey the same meaning. The wording does not have to be exactly like these answers.

1. a. science - possessing knowledge instead of ignorance and misunderstanding; knowledge that has been formed and related to discovery of general truths or operation of general laws; knowledge obtained and tested by use of the scientific method.

   b. scientific method - the procedure used to gather knowledge that involves (1) recognizing and stating a problem, (2) collecting data by observing and experimenting, (3) formulating an hypothesis, and (4) testing the hypothesis.

   c. superstition - a belief resulting from ignorance or fear; trust in magic; a notion maintained despite evidence to the contrary.

2. Lists will vary, but might include such items as:

   a. "Handling toads causes warts." Test by catching several toads. Have a number of students who have no warts on their hands hold each toad. Observe these students' hands over a period of several weeks to see if warts appear.

   b. "Lightning never strikes twice in the same place." Talk to building managers of very tall structures. Examine records and/or photographs of lightning strikes on the Empire State Building, the Washington Monument, television transmission towers, etc.

   c. "If you sweep under a person's feet, that person will not marry." Sweep under the feet of everyone in a class of seniors. Check the group's marital status five (5) years and ten (10) years later. (An investigation conducted over a relatively long time interval, such as this, is called a longitudinal study.)

3. Superstitions are found most often among people who are poorly educated. Because of this, in our society there are more superstitions among older people than there are among younger people.

4. People have developed superstitions to explain things that they did not understand and to establish causes for things that happened to them or around them.

5. The list of possibilities is long. Check the ten (10) that you found in reference books or in the check list you prepared for Activity 3-1.2.

6. Answers will vary. However, your investigation should follow the general procedures of the scientific method.

If you have answered five (5) of these six (6) questions correctly, you are probably ready to take the final evaluation. Ask the teacher for this evaluation. If you did not answer at least five (5) of these questions correctly, you should review the activities and consult with your teacher.

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